- Once the starting rate base has been established, a rate base methodology known as "Trended Original Cost" ("TOC") should be implemented. TOC trends the starting rate base (and depreciation) for inflation and reduces the current cash earnings by a corresponding percentage, leading to a rate base and annual capital charges that more closely track those in competitive, unregulated industries than a rate base or capital charges based on net book costs.

The remainder of the report consists of three major parts. Section II discusses the economic principles that must be recognized if the Commission is to adopt fair and workable standards for cable cost-of-service regulation in the future. These principles guide an examination in Section III of evidence on asset values, which bears on the starting rate base standard the Commission should adopt. Section IV briefly summarizes our conclusions. Appendix B describes how to implement a trended original cost system and provides an example.

II. RELEVANT ECONOMIC PRINCIPLES

The Commission faces an extraordinarily difficult task: devise a fair and workable set of rules for cost-of-service regulation of a previously unregulated, rapidly growing, heterogeneous industry. Each of these three adjectives -- "previously unregulated," "rapidly growing" and "heterogeneous" -- implies that difficult problems must be solved. Together they describe a set of problems of unprecedented scope and difficulty.

Moreover, the Commission has indicated a desire for a primary system of regulation based on competitive prices rather than cost-of-service calculations. As economists, we applaud this goal. However, we must also note that it imposes additional constraints on the kinds of cost-of-service standards that can be adopted. Fortunately, the cost-of-service approach that is consistent with competitive prices is known and can be adopted by the Commission.

The combination of problems that the Commission now faces cannot possibly be solved unless the solutions are firmly grounded in the relevant economic principles. This section therefore reviews these principles. It first sets the stage with a review of the economic goals of rate regulation. It next addresses the value of assets in competitive industries, and ties these values to the annual cash flows investors expect under competition. It turns out that both asset values and annual cash flows behave very differently under competition and traditional historical-cost[1] rate regulation, especially in rapidly growing industries. This fact is of profound importance to cable regulation in several different ways.

These differences can be linked to the procedures used to set the regulated rate base. Here, the Commission must reach two vital decisions: (1) how to set the starting rate base for cost-of-service evaluations; and (2) how to update the rate base from year to year to maintain consistency with the competitive benchmark/price-cap standards the Commission also proposes to use.

A. ECONOMIC GOALS OF RATE REGULATION

It is a truism to say that economically, rate regulation is a substitute for competition in markets where the relevant legislative body deems competition to be insufficient. Thus, rate regulation tries to limit profits to the level they would be under competition. It also tries to encourage the regulated firm to be as cost-efficient as a competitive firm would be.

However, actual competition does more than limit profitability and encourage cost efficiency. Competition also sends the right price signals to customers, prices that reflect the value of the goods and service foregone because this service is purchased instead. These three features -- competitive profitability given the level of risk, cost efficiency, and price

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[1] In this paper, "historical cost" is the dollar outlay at the time of first construction plus an allowance for funds used during construction. "Net" historical cost is that cost less accumulated depreciation.

efficiency -- are characteristics of competition in equilibrium, *i.e.*, in stable competitive markets.

Some markets are not stable, and competition has additional socially beneficial effects in such unstable, dynamic markets. Competition encourages innovation and the creation of new and better products, by rewarding innovators with profits *above* the normal level the firm would expect in competitive equilibrium.[2] It also directs resources to their best use, by offering above-normal profitability in growing markets and below-normal profitability in shrinking markets.

Rate regulation typically downplays or ignores altogether some of these other benefits of competition. For example, as explained in detail below, a historical-cost rate base does not produce efficient prices, because competitive prices (which are efficient prices) are based on the current values of assets rather than their historical costs. Regulation also often does not focus on the dynamic benefits of competition, and with the best will in the world, regulation can actually discourage them. For example, regulators require administrative simplicity because of time and budget limits. Product diversity increases the regulatory burden, and even if regulators actively encourage companies to offer new products, the need for regulatory oversight may slow or prevent their introduction. Competition rewards change and diversity, while regulation requires stability and simplicity.

Competition also rewards successful risk-taking with above-normal profitability until competitors catch up. Cost-of-service regulation limits the opportunity for above-normal

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[2]   As is widely recognized in rate regulation, the expected rate of return in competitive equilibrium equals the "cost of capital," defined as "the expected rate of return in capital markets on alternative investments of equivalent risk." *See*, for example, Stewart C. Myers, 1972, "The Application of Finance Theory to Public Utility Rate Cases," *The Bell Journal of Economics and Management Science*, 3 (Spring): 58-97; Richard A. Brealey and Stewart C. Myers, 1991, *Principles of Corporate Finance* (4th edition), New York: McGraw-Hill, Inc., Chapters 7 to 9; and A. Lawrence Kolbe and James A. Read, Jr., with George R. Hall, 1984, *The Cost of Capital*, Cambridge, MA: The MIT Press, Chapter 2.

profitability and therefore discourages risk-taking. It especially discourages investment when it limits the opportunity for profit by more than it limits the risk of loss.[3]

The purpose of this review is not to castigate the institution of rate regulation, but rather to begin the exploration of how rate regulation should be instituted for cable operators with a broad look at what rate regulation should try to accomplish, from an economic perspective. The cable industry is being regulated from scratch, and this provides the Commission with an opportunity to avoid some of the problems that we now know exist with historical-cost regulation. The Commission has the opportunity to institute a price-efficient system, not merely a cost-efficient one.[4]

Moreover, this industry is expected to require substantial amounts of new capital to take advantage of fundamental changes in production technology (e.g., fiber optics, interactivity, etc.) that will bring many new services to customers. This is precisely the kind of dynamic change that rate regulation has the potential to discourage, either by establishing an asymmetric risk-reward tradeoff that discourages the investment, or by instituting administrative procedures that delay or prevent the introduction of new products. Also, the decision the Commission makes regarding the starting rate base has the potential to penalize investors in ways inconsistent with competitive market values and returns, and thereby to

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[3] *See* A. Lawrence Kolbe and William B. Tye, 1991, "The *Duquesne* Opinion: How Much '*Hope*' Is There for Investors in Regulated Firms?", *Yale Journal on Regulation*, 8 (Winter): 113-157; Stephen F. Williams, "Fixing the Rate of Return After *Duquesne*," *Yale Journal on Regulation*, 8 (Winter): 159-163; A. Lawrence Kolbe and William B. Tye, 1992, "The Fair Allowed Rate of Return with Regulatory Risk," *Research in Law and Economics*, 15; A. Lawrence Kolbe, William B. Tye and Stewart C. Myers, 1993, *Regulatory Risk: Economic Principles and Applications to Natural Gas Pipelines and Other Industries*, Boston: Kluwer Academic Publishers. An economically arbitrary starting rate base (*e.g.*, one based on net historical cost, or as will be seen below, one based in this industry on net replacement cost) can have just such an effect.

[4] Indeed, the Commission's initial focus on a benchmark/price-cap system based on competitive prices indicates a desire to do just that. Subsequent sections demonstrate that a competitive-price-based system is fundamentally incompatible with a cost-of-service system based on net historical cost.

drive away capital (or what is the same thing, to raise its cost to unachievable levels) in years when the industry would otherwise invest substantial sums.

Here, the Commission faces a difficult balancing act among the various benefits of competition that it might try to encourage with its regulatory procedures. If cable customers are to realize the promise of this industry, the Commission will have to implement cost-of-service standards that accomplish two tasks:

- Implement a transition that balances the needs of customers for reasonable rates with the facts of the industry as it stands. (For example, different cable companies face a wide variety of financial circumstances, ranging from companies that have debt well in excess of the net historical cost of their assets to companies that have paid off their debt and written off almost all of the net historical cost of their assets.)

- Implement an on-going system of regulation that is consistent with the long-run needs of customers and with the benchmark/price-cap approach the Commission is also adopting.

Both of these tasks require a deeper understanding of the value of assets under competition than rate regulation normally has to consider.

B.   ASSET VALUES UNDER COMPETITION

Most cost-of-service regulation today uses net historical cost as the standard for rate base value. This is a simple and objective standard to administer, and procedures have evolved that aim at a rate of return on net historical cost equal to the expected rate of return in competitive equilibrium.

However, net historical cost has little or no meaning for competitive firms. What matters under competition is current *market* value. Historical cost is recorded at the time the asset is acquired, and thereafter is written off according to an accounting depreciation schedule (typically straight-line). Three main factors make market value different from net historical cost:

• The value of competitive assets increases with inflation, all else equal; net historical cost is not updated for inflation.

• The value of competitive assets reflects technological change, relative productivity during the years of operation, and similar factors. These factors imply that the year-to-year change in asset market value, even in a world with no inflation, does not necessarily correspond to a straight-line write-off.

• In new or expanding industries, the value of competitive assets also reflects growth opportunities that a presence in such an industry creates. These opportunities would ordinarily show up on a company's books only when they are part of acquisition cost.

The first two of these factors imply that assets in competitive equilibrium will be worth net replacement cost. The third implies that in growing industries under competition, assets will be worth *more* than net replacement cost.

This should come as no surprise. After all, industries grow under competition *because* new assets are worth more than they cost to build, and old assets are worth more than net replacement cost. Capital keeps coming in until incremental investments are worth only what they cost, at which time equilibrium is established with asset value equal to net replacement cost.[5] Similarly, industries contract under competition because new assets are worth less

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[5] Equilibrium in this sense refers to matching capacity to average demand levels, not the ups and downs of a business cycle.

than they cost, and old assets are worth less than they cost to replace. (The buggy whip industry dies when it no longer pays to replace the worn-out buggy whip factory.)

Moreover, a presence in a growing industry confers not merely immediately profitable investment opportunities, but also valuable *growth options* if the industry continues to expand. That is, "being a player" in a growing industry means that the company can take advantage of new investment opportunities later on, but need not do so if industry growth slows or other problems arise. Such options are especially valuable because they confer the *right* but not the *obligation* to invest,[6] and that value can be a large part of the market value of companies in a rapidly growing, competitive industry.

Finally, even in a stable competitive industry, assets may be worth more to one party than to another. Thus, there may be administrative and marketing scale economies to operating twenty cable systems in one metropolitan area instead of twenty otherwise identical systems scattered across the country. A company could rationally pay a premium over net replacement cost to acquire a system that permitted such scale economies, which would represent a splitting of the benefits with the original owner.

Thus, the market value of a competitive company may far exceed not only the net historical cost of its assets, but even the net replacement cost of its assets. Rapid growth implies the assets themselves are worth more than net replacement cost, and the associated growth options provide additional value that is not directly tied to the value of the company's current assets at all. Finally, even without rapid growth, transactions that permit more efficient operation can take place at prices above net replacement cost.

These facts have profound significance for the Commission's interpretation of the financial history and condition of the cable industry. Thus, the fact that regulation normally values

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6   *See,* for example, Richard A. Brealey and Stewart C. Myers, 1991, *Principles of Corporate Finance* (4th edition), New York: McGraw-Hill, Inc., Chapters 20 and 21.

assets at net historical cost, or that assets are worth net replacement cost in competitive equilibrium, may tempt the Commission to conclude that any asset value over these levels represents the capitalized value today of expected future monopoly profits.[7] Such a conclusion simply does not follow. The mere presence of value over net historical cost or net replacement cost, perhaps recorded as "intangibles" or "goodwill" or "excess acquisition costs" on the books of one cable firm that acquires another, does not necessarily imply that capitalized monopoly profits were or are part of the value of the cable company.

We return to this point at length below. First, however, it is necessary to explore more thoroughly the reasons that rate-regulated asset values differ from unregulated asset values even for firms in competitive equilibrium.

C.   CASH FLOWS UNDER REGULATION AND COMPETITION

The difference in competitive and rate-regulated asset values reflects an underlying difference in the lifetime pattern of cash flows to investors. An understanding of this difference helps overcome the natural, but in this context misplaced, tendency for regulators to start with a net historical cost rate base. It also has important implications for the kind of cost-of-service standard that should be adopted for the future.

1.   Cash Flow Patterns Over Asset Life

The standard approach to cost-of-service regulation in the U.S. today constrains expected dollar profits to a reasonable rate of return multiplied times the depreciated historical cost

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[7]   Here, we use "monopoly" in a non-literal sense. That is, even in cities with only one cable operator, there are alternative forms of information and entertainment, usually including direct TV broadcasts. Thus, whether something is literally a "monopoly" depends on how narrowly one defines the market. Here, we use the term merely to indicate the potential for profitability above that which would exist in a competitive industry in otherwise identical circumstances.

of the assets. This appears to be the Commission's starting point in the NPRM.[8] However, this is *not* the way prices are set under competition, so such a system runs into severe problems whenever (1) inflation rates are high, (2) new assets are added in "lumpy" increments; or (3) the regulated entity faces competition (either actual competition or the regulatory simulation of competition through a price-cap mechanism).
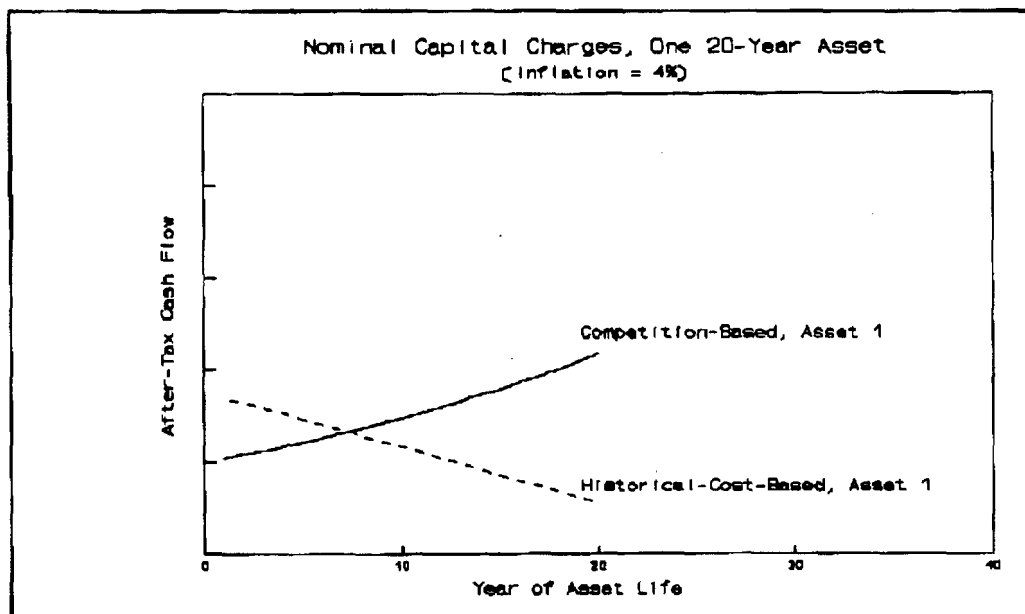

Figure 1

Use of a standard based on historical book cost to test the level of customer charges is very different from what happens under competition. As illustrated in Figure 1, capital charges[9] based on a historical-book-cost asset value standard are in conflict with the pattern of prices over the life of capital investments in competitive equilibrium. The fundamental point is that

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[8]   NPRM, p. 20, paragraph 35.

[9]   For purposes of illustration, "capital charges" are defined here as the sum of after-tax operating earnings plus depreciation. In principle, income taxes and perhaps maintenance expenses (if such expenses increase materially in constant-dollar terms over the asset's life) should be included, too.

in competitive markets, prices are independent of the age of the assets employed. (For example, the price of tomatoes does not vary with the age of any given farmer's tractor or when the farmland was purchased.) By comparison, the regulated prices can depend very heavily on the age of the assets. (Thus, the price of electricity from a 1960 plant is much lower than that from an otherwise identical 1990 plant.)

The fundamental source of the difference is the way inflation is handled under traditional cost-of-service regulation.[10] Under competition, asset values grow with inflation, at least on average, while under traditional regulation they remain at net historical cost. Since assets appreciate in value with inflation, competitive firms in equilibrium end up with lower initial amounts in cash. (For example, a landlord in a "hot" real estate market who expects the apartment building to grow in value rapidly would be willing to take a lower rate of return in cash rents than one in a staid market.) Historical-cost-regulation, in contrast, forces the regulated company's entire return to come in cash rather than asset appreciation. As a result, historical-book-cost-based capital charges are too high in early years and too low in later years.

Thus, the regulatory capital charges on otherwise identical electric plants built thirty years apart are very different, one of the causes of the "rate shocks" electric customers faced in the 1980s. This is illustrated in Figure 2, which contrasts historical-book-cost-based and competitive capital charges with end-to-end replacement of otherwise identical assets.[11] Under competition, the price in the last year of the old asset differs from the price in the first year of the new asset only by one year's inflation. In contrast, under historical-cost

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[10] Another source of difference is use of accounting depreciation schedules, which often will not track the changes in economic value even with no inflation at all.

[11] Of course, end-to-end replacement is the most extreme example of this type of problem, but it can be shown that problems will exist even with smoother growth patterns, unless the firm grows continuously at just the right rate. See Stewart C. Myers, A. Lawrence Kolbe and William B. Tye, 1985, "Inflation and Rate of Return Regulation," *Research in Transportation Economics*, Volume II, Greenwich, CT: JAI Press, Inc., pp. 93-95 and 113-115.
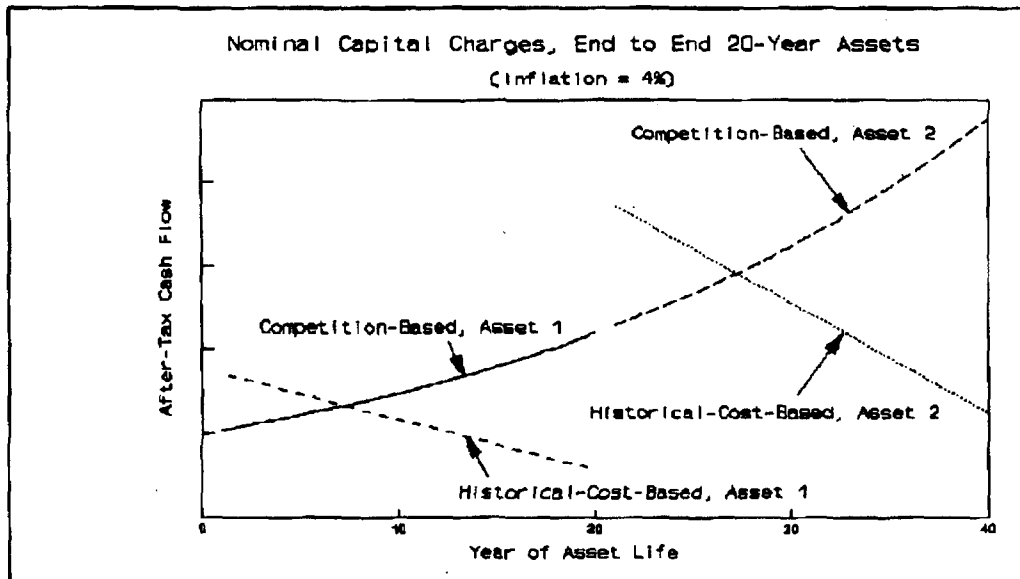
Nominal Capital Charges, End to End 20-Year Assets
(Inflation = 4%)

Competition-Based, Asset 2

Competition-Based, Asset 1

Historical-Cost-Based, Asset 2

Historical-Cost-Based, Asset 1

After-Tax Cash Flow

Year of Asset Life

Figure 2

regulation, the last year of the old asset is underpriced and the first year of the new asset overpriced, relative to competitive prices. Customers naturally object to such sharp changes, which are unlike what happens in competitive equilibrium. This type of "rate shock" therefore creates problems for commissions, as well, who find themselves caught between customers' complaints and the statutory requirement to offer investors a fair return.[12]

Implicit in Figure 2 is a potential problem for the Commission in cable regulation, also. Suppose the Commission succeeds in identifying a competitive price standard as the primary regulatory guideline, but then adopted a cost-of-service standard based on an economically

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[12] Investors can also lose if faced with both regulation and competition. If competition limits prices in some years and historical-cost regulation limits prices in other years, the investors can find themselves shortchanged. This turns into a problem for customers when investors refuse to sink new capital in the business until the rules change.

reasonable original cost rate base.[13] Such a cost-of-service system would still yield general pattern of cash flows over time like the historical-cost-based ones in Figure 2, while a successful competitive price standard would have a pattern like the competition-based lines in Figure 2. Thus, the Commission's competitive-price standard would be incompatible with its cost-of-service standard. Some other cost-of-service standard is needed if the competitive and cost-of-service standards are to give compatible answers.

2.   "Trended Original Cost" as the Future Cost-of-Service Standard

Thus, both in the interest of price efficiency and in the interest of adoption of a cost-of-service standard that is consistent with the competitive-price standard the Commission wishes to adopt, historical-cost-based regulation must be rejected as the future cost-of-service standard in this industry. Instead, the starting rate base and future asset additions should be trended for inflation, and the allowed rate of return on that rate base should correspondingly exclude the effects of inflation.

Trended Original Cost ("TOC") was developed for regulated companies as a way of approximating the time patterns of asset values and earnings in competitive industries subject to inflation. TOC "writes up" asset values for inflation, but sets earnings rates and capital charges in *real* terms, that is, without including any inflation premium in current income.

An example will illustrate the basic idea. Suppose $1,000 is invested in a new asset. Also suppose that the nominal cost of capital is 16 percent, consisting of a 4 percent inflation premium and a 12 percent real return. If capital charges are based on *original* costs -- with no recognition of inflation in asset values -- investors require the entire cost of capital in current income in each year, or $160. Under TOC, inflation is recognized, and investors

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[13]   That is, a system in which a starting rate base equal to competitive market value were booked and thereafter treated like a normal book-value rate base, with a nominal cost of capital (*i.e.*, one that includes the inflation premium) as the allowed rate of return.

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receive only the *real* rate of return (12 percent) in current income and receive the inflation premium (4 percent) in the form of capital appreciation. For regulated companies, this 4 percent would show up as a 4 percent write-up to the rate base.

In the first year, this amounts to a $120 return in current income and a $40 increase in asset value. The $40 can be viewed as a reinvestment in the business of the inflation premium demanded by investors. Since the $40 is equivalent to an additional investment, investors require the cost of capital on this amount in the following year. They must also be allowed to recover this amount in later years through higher depreciation charges than would be required absent the write-up.

So far, no distinction has been made between the general rate of inflation, *i.e.*, the inflation that investors are worried about, and asset-specific price changes. However, asset-specific prices may change at a different rate than the general price level because of changes in productivity or other factors specific to the particular industry under examination. Ideally, asset- or industry-specific indexes would be used to trend asset values. However, if an asset-specific index is used, any deviation between the expected rate of increase in that index and general inflation should be taken into account in calculating allowed earnings.

Suppose that an asset-specific index is forecasted to increase at 5 percent, while general inflation is 4 percent. If investors receive an extra 1 percent write-up of their asset values, they require 1 percent less in current income. Investors get less than the real opportunity cost of capital in current earnings, but they make up the difference in the form of a larger write-up. This is exactly what would happen in competitive equilibrium if specific assets are expected to increase faster than the general rate of inflation.

While the ideal is an asset-specific inflation index, if that ideal is unattainable the answer is to use a general inflation index, not to fall back to original cost. Unattainability of the "perfect" should not be permitted to prevent adoption of the "good." Thus use of a general

inflation index may well be the best way to get started on a TOC cost-of-service system for cable regulation.

TOC may seem strange to someone used to regulating on net book cost, but the implementation procedures actually are straightforward. Very briefly, assets are segregated by category and vintage and are written up to reflect inflation, as is depreciation. TOC can be adapted to accommodate any depreciation schedule that is deemed appropriate for the industry. Appendix B to this paper describes how the system can be implemented in somewhat more detail and gives numerical examples.[14]

D. RATE BASE VALUE AND ASSET VALUE

For rate-regulated industries under a cost-of-service standard, it is an economic truism that rate base value ultimately determines market value. The reason is straightforward: market value depends on the future cash flows investors expect as a result of owning an asset, and under cost-of-service regulation, those cash flows depend on the value of the rate base.

This has long been recognized as a legal matter as well. Thus, the U.S. Supreme Court has stated that

> The fixing of prices, like other applications of the police power, may reduce the value of the property which is being regulated. But the fact that the value is reduced does not mean that the regulation is invalid. [Citation omitted.] It does, however, indicate that "fair value" is the end product of the process of rate-making not the starting point as the Circuit Court of Appeals held. The

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[14] Further details and discussion of the economic benefits of Trended Original Cost may be found in the following articles: Stewart C. Myers, A. Lawrence Kolbe and William B. Tye, 1985, "Inflation and Rate of Return Regulation," *Research in Transportation Economics*, Volume II, Greenwich, CT: JAI Press, Inc.; Stewart C. Myers, A. Lawrence Kolbe and William B. Tye, 1984, "Regulation and Capital Formation in the Oil Pipeline Industry," *Transportation Journal*, Spring; and William B. Tye and A. Lawrence Kolbe, 1992, "Optimal Time Structures for Rates in Regulated Industries," *Transportation Practitioners Journal*, 59 (Winter): 176-199.

heart of the matter is that rates cannot be made to depend upon "fair value" when the value of the going enterprise depends on earnings under whatever rates may be anticipated.[9]

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[9] We recently stated that the meaning of the word "value" is to be gathered "from the purpose for which a valuation is being made. Thus the question in a valuation for rate making is how much a utility will be allowed to earn. The basic question in a valuation for reorganization purposes is how much the enterprise in all probability can earn." [Citation omitted.]

Federal Power Commission v. Hope Natural Gas, 320 U.S. 591, 601-602 (1944).

The problem here, however, is not merely to determine "how much a utility will be allowed to earn" once cost-of-service regulation is underway -- it is to determine the value of the "utility's" assets on the date first devoted to public service through a new statute.

Since the starting or transition rate base value standard that the Commission selects *will* determine the market value of the assets under cost-of-service regulation, it is impossible to escape the conclusion that a "too low" starting rate base value would take without compensation a share of the value of the cable companies' property as of the date of regulation. (For example, a starting rate base of zero -- which we understand is not a mere theoretical possibility for some cable systems if depreciated historical cost were the standard -- would imply zero future earnings and therefore would take the entire market value of the property as of the date of regulation.) The issue, of course, is how to decide what would be "too low."

From a purely economic standpoint, if new investment is to be attracted to this industry on reasonable terms, existing investment must be offered the chance to earn an economically fair return. This requires not only that rates be set so investors have a fair opportunity to earn at least their cost of capital, but also that those earnings be based on a rate base that is economically reasonable. Financial markets and future investors will respond to a huge loss

and future customers will pay the price either in more expensive capital or foregone services, or both. Thus, a cost-of-service system that eliminated a large share of the value of cable assets by choosing a starting rate base that is "too low" would have severe economic consequences not only for investors, but also for customers.

Therefore, the remainder of this paper investigates the issue of how to establish a starting rate base that is not "too low". The starting point of this investigation thus must be what the cable companies were worth prior to the regulation of the industry by the Cable Act of 1992. The natural economic goal for the starting rate base is *competitive* market value. Net historical cost, in contrast, would make no sense as a starting rate base, because net historical cost does not measure value for unregulated companies. Therefore it cannot possibly measure the value of the assets taken for public service by the regulation of the cable industry. The Commission could with as much principled justification draw a number at random out of a hat. Net historical cost is a wholly arbitrary and capricious value to pick as the starting rate base for a previously unregulated industry.

Actual pre-regulation market value is the natural point to begin determination of a compensatory starting rate base. However, actual market value *may* in this case include some capitalized monopoly profits. It is presumably the FCC's intention to eliminate any capitalized monopoly profits, if there are any, from the starting rate base. As economists, we agree that the proper standard is competitive market value. The question then becomes how to determine whether in fact actual market values include any capitalized monopoly profits, and if so, how to quantify them.

III. EVIDENCE ON COMPETITIVE MARKET VALUE

Recent years have seen rapid growth in the cable television industry. For example, according to data in the National Cable Television Association's *Cable Television Developments* (March 1993), since 1980 the number of basic subscribers has more than

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tripled, increasing from approximately 17.6 million subscribers to approximately 54.8 million subscribers. (p. 2-A) Over the same period, the number of systems more than doubled, increasing from 4,225 systems to 11,075 systems. (p. 4-A)

As noted above, under competition such growth is associated with values for existing assets above net replacement cost and with valuable growth options that are not directly tied to the value of existing assets. Moreover, there may be cost efficiencies associated with integration of systems in a particular geographic region that command a price above net replacement cost even in a stable industry. Thus, competitive market value in such circumstances exceeds net replacement cost. When a competitive firm in such circumstances is sold, the value above historical cost may receive a variety of labels on the acquiring company's books (*e.g.*, "goodwill," "intangibles" or "excess acquisition cost").

There is also the possibility that the value of the companies includes capitalized expected future profits in excess of those that would exist under competition. It is presumably the Commission's intention to exclude any capitalized monopoly profits from the starting rate base.[15] Thus, we attempted to find a way to quantify the share, if any, of capitalized monopoly profits in cable company values as of given dates.

There are three major ways to determine the market value of assets: appraisals, analysis of comparable transactions, and observation of market data for publicly traded companies. One may also attempt to derive estimates of competitive market value using these major techniques. Since we are not appraisers, we decided to pursue the second two options.

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[15] See footnote 7 regarding the definition of "capitalized monopoly profits."

A. CABLE SYSTEM TRANSACTIONS

Our initial intention was to analyze prices for transactions involving companies that could reasonably be characterized as facing competition or charging rates that could for whatever reason be characterized as free of monopoly profits. Prices for these transactions could then be compared to prices for transactions involving other cable companies to determine the amount of transaction value potentially attributable to capitalized monopoly profits. Unfortunately, in the time available, we were unable to identify a appropriate control group of companies charging "competitive" rates. Moreover, in most cases we were unable to determine any clear patterns in the determinants of transactions prices per subscriber.[16]

Several patterns did emerge from the data that warrant comment. First, average transaction price per subscriber measured in real terms (*i.e.*, eliminating the effects of inflation) in 1983 dollars[17] increased steadily through the 1980s. Prices for transactions involving more than 20,000 subscribers reached a peak of $1,910 (1983 dollars) in 1988, while transactions of

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[16] We examined data on transactions between 1980 and March 1993. We obtained our data from five sources: First Boston, Morgan Stanley, Toronto Dominion Bank, Kagan Associates' *Cable TV Financial Databook* (various issues), and *Broadcasting* (again, multiple issues). We obtained data for as long a period as possible from each data source. We initially entered all transactions for which we had data. We then eliminated from our database transactions for which the source data were clearly incorrect (e.g., in one case the data revealed a price per subscriber in excess of $140,000.) In many instances, the same transaction appeared in multiple sources. In these cases, we averaged the values (e.g., total consideration paid, number of subscribers, etc) in the different sources unless the sources were significantly different. In the cases of serious discrepancies, we eliminated the observation from our data base. We were left with over 1700 transactions in our data base. Quite a few of these involve small systems; of the total only 407 involved systems with 20,000 or more subscribers.

We tracked the transactions values and the transaction prices per basic subscriber in both nominal and real (corrected for inflation) terms. We attempted to find correlation between a variety of characteristics and the price paid per subscriber. The characteristics we examined included region, size of transaction, number of subscribers, terms of the deal (cash, debt assumption, asset swap, etc), homes passed, and the degree of penetration.

[17] The Consumer Price Index is reported so 1982-1984 has a baseline value of 100. For convenience, we refer to this as "1983 dollars".

all sizes peaked at $1,733 (1983 dollars) per basic subscriber in 1990. Real prices fell off sharply after 1990 and remained depressed relative to recent historical levels in 1991 and 1992. They appeared to be recovering somewhat in 1993 but as of March (the last date in our database) were still well below the levels observed in the late 1980s and 1990. See Figures 3a and 3b.

Some of the drop-off after 1990 may be attributable to the general economic downturn, while some may also be attributable to heightened legislative and regulatory activity aimed directly at cable. In addition, in late 1989, tighter controls were placed on the ability of banks to participate in highly leveraged transactions. Anecdotal evidence suggests that the latter had a serious affect on the ability of potential investors in cable systems to obtain financing, and so may have encouraged a more conservative approach to projections of expected future costs and revenues. However, we do not see any clear pattern in the transactions that took place after 1990.[18] If prior transaction prices had included some degree of monopoly profits, one might expect to see average transaction prices continuing to fall as the prospect of regulation became more concrete and the details of the nature and extent of rate regulation became increasingly clear, e.g., with the passage of the October 1992 Cable Act and successive statements by the FCC.

Two factors inhibit our ability to draw any conclusions concerning the determinants of transactions prices and whether they contain any monopoly rents from the transactions data. First, our comprehensive data set extends only through March of 1993. While we could have updated the database for selected transactions reported in the press, we could not be sure we had the same degree of comprehensive coverage to make meaningful comparisons with prior years. In addition, we encountered what is known as the "signal to noise" problem in statistical work. Briefly, the "signal" is a clear relationship that emerges from the data. The "noise" arises from the degree to which individual observations (in this case

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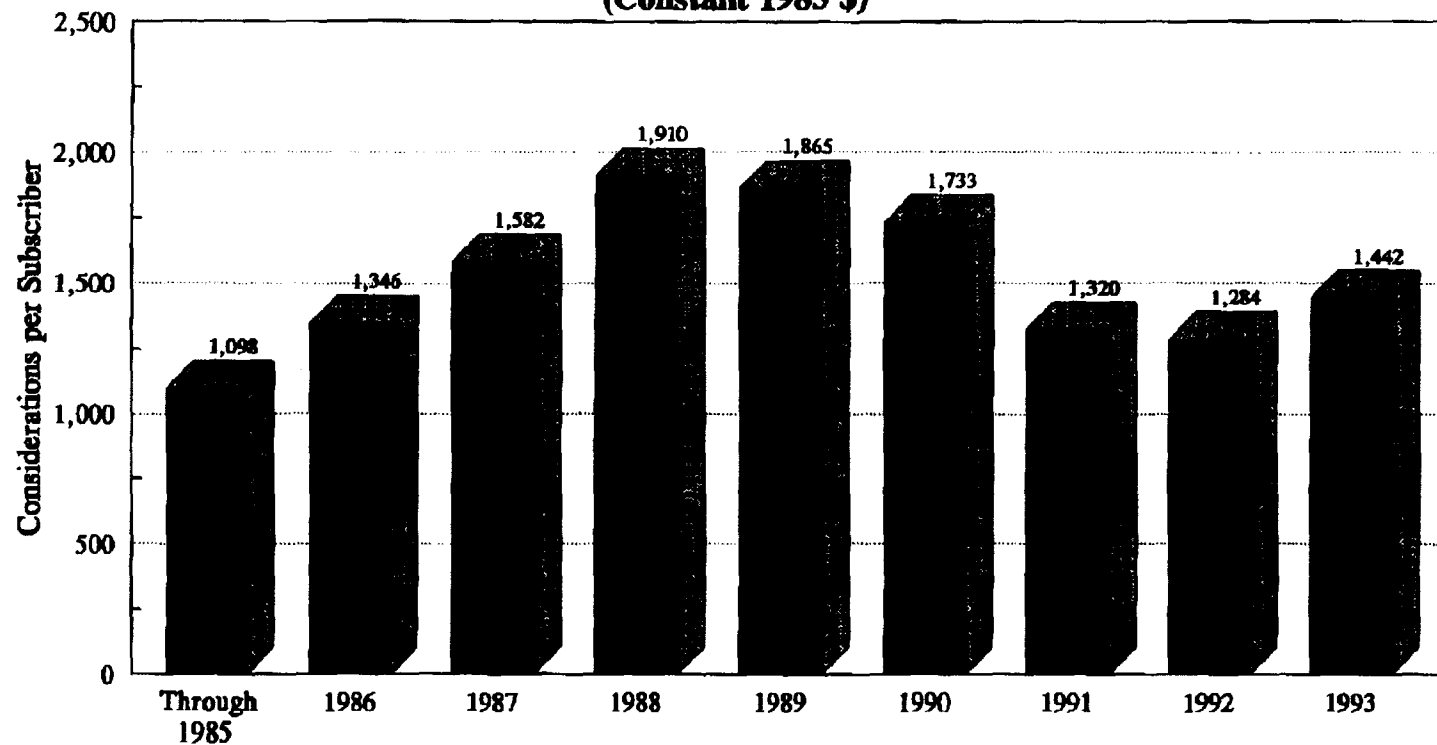[18] An examination of monthly data reveals considerable volatility and no clear trends.

Figure 3a
Simple Average of Consideration per Subscriber
All Transactions
(Constant 1983 $)
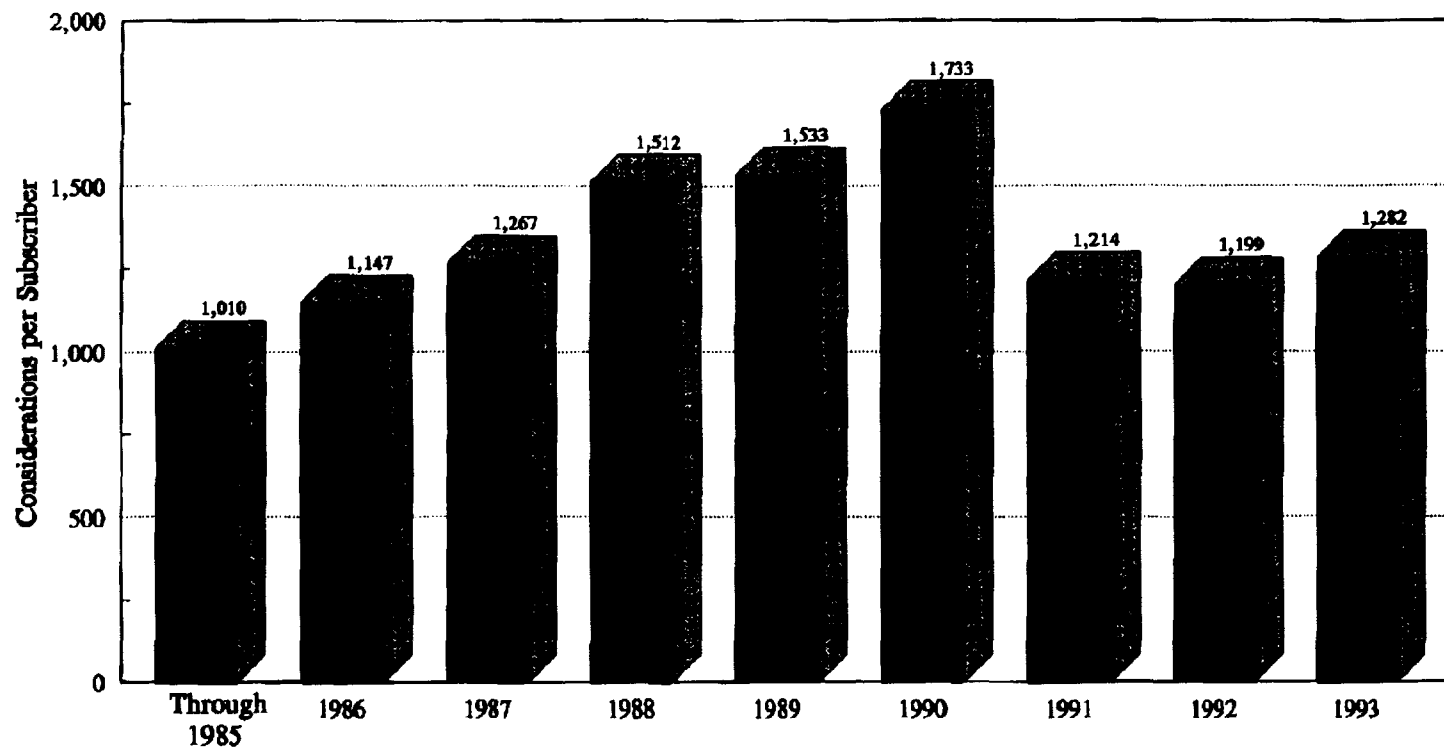
Note: 1993 is through March only.

Figure 3b
Simple Average of Consideration per Subscriber
Transactions Involving More Than 20,000 Subscribers
(Constant 1983 $)



Note: 1993 is through March only.

transactions) deviate from the signal. Noise may arise either as a result of faulty data or because underlying statistical relationships are either very complex or do not in fact exist. Given the time available to us, we were unable to separate any clear signal from the noise. As a result, we decided to turn our attention to the analysis of stock market data for publicly traded companies. Stock market data have the clear advantage of allowing us to track changes in values of the same companies over time in response to specific events. This eliminates many potential sources of "noise" and permits a more detailed examination of time series data.

One phenomenon that did emerge from the transactions data is worth mentioning before we turn to our discussion of our stock market analysis. One of the few notable patterns that emerged is the apparent relationship between the degree of penetration in a market and the transaction price per basic subscriber. Figure 4 shows much higher prices per subscriber for systems with very low levels of penetration than for systems with moderate to high levels of penetration. This is consistent with the existence of greater growth opportunities for systems with less penetration.

B.   STOCK MARKET EVIDENCE

We considered another data source besides cable system transactions in the search for evidence of capitalized monopoly profits: stock price movements for publicly traded cable companies. Specifically, we searched for "pure plays" in the cable business: publicly-traded corporations whose sole or principal business was operating cable systems. We identified eight such companies. The companies and the share of revenues derived from cable are shown in Table 1.

Figure 4
Penetration Rate vs.
Average Consideration per Subscriber
(Constant 1983 $)
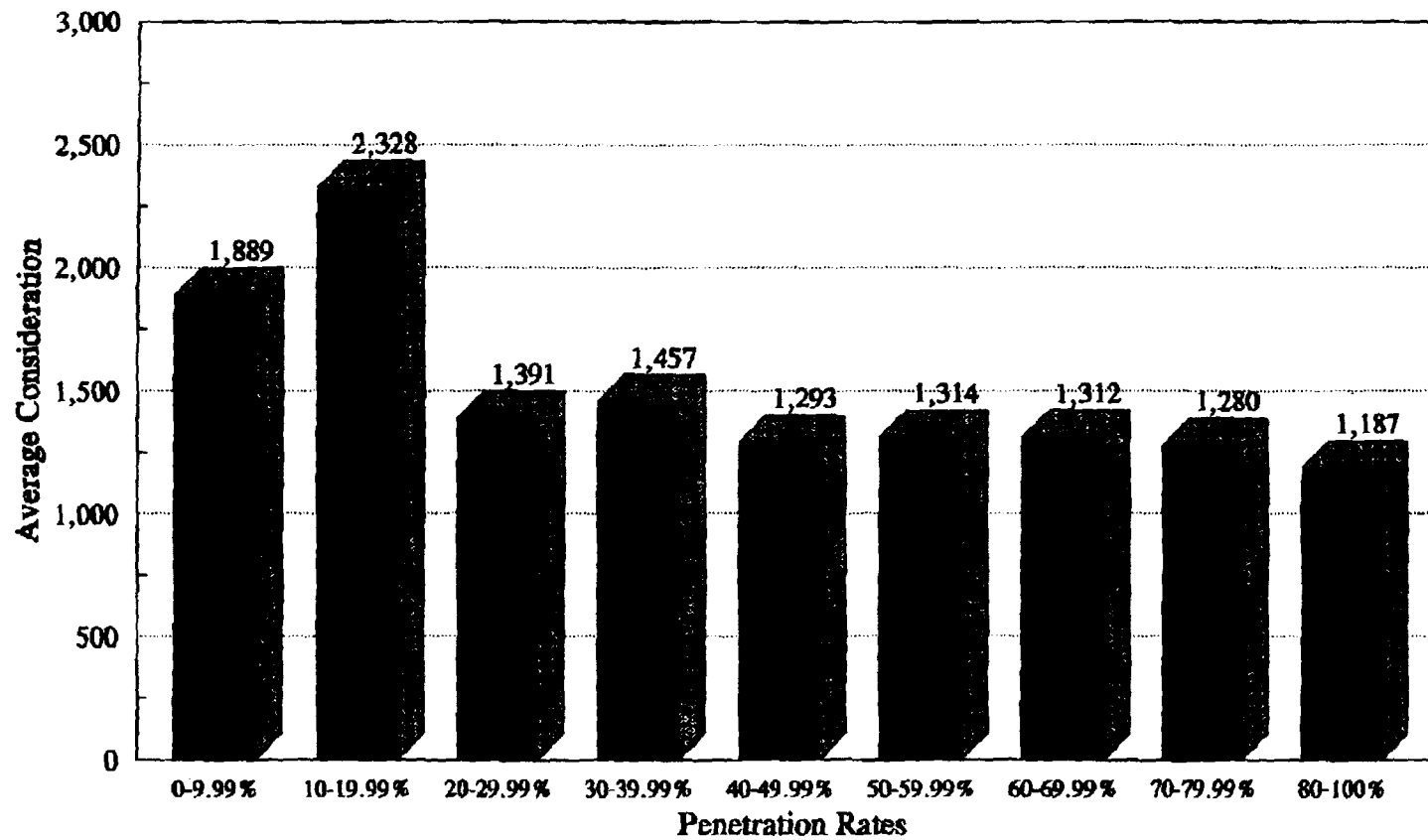
Sources: First Boston, Morgan Stanley, Toronto Dominion Bank, Kagan Associates' *Cable TV Financial Databook* (various issues), and *Broadcasting* (various issues).

TABLE 1 THE SAMPLE OF PUBLICLY-TRADED CABLE SERVICE COMPANIES	Cable Service Revenue (as a % of Total 1992 Revenue)
Adelphia Communications Corporation	95.0%
Cablevision Systems Corporation	95.0%
Century Communications Corporation	90.0%
Comcast Corporation	80.9%
Jones Intercable, Inc.	67.0%
Jones Spacelink, Inc.	67.0%
TCA Cable TV, Inc.	99.0%
Tele-Communications, Inc.	99.0%

If capitalized monopoly profits were part of the value of these companies, and if regulation signalled an end to such profits, then the stock market value would fall by the amount of the capitalized monopoly profits. Thus, looking at the fall in stock market value due to the market's realization that regulation was coming would measure the proportion of capitalized monopoly profits in pre-regulation stock market value. If this were converted to a share of assets (as opposed to a share of equity), the Commission would have a benchmark to use to adjust cable starting rate bases for capitalized monopoly profits.

Of course, in practice it is more complicated than that. Part of the problem is that other things happen that affect stock prices. Another part is that it is difficult to identify just when the stock market decided regulation was coming. A third part is that the market may have had different ideas at different times about just what rate regulation meant in practice.

Studies of stock market response to developments affecting a company are called "event studies." We were able to perform only a limited event study in the time available for

response to the NPRM. Specifically, we created both a value-weighted and an equally-weighted portfolio of the eight cable companies and tracked the cumulative return on these portfolios in the months leading up to cable regulation and after regulation began.

Since events other than regulation may affect these cumulative returns, we need a way to control for such events. Our approach is two-fold: first, we look at a portfolio, not the individual companies, to try to capture only events affecting the industry as a whole. Second, we also track the predicted return on the portfolio given what the stock market did over the period. We predict the return based on the "beta" of the portfolio and on the month-to-month movements in the market.[19]

The cumulative return series for the two cable portfolios, the predicted cable returns,[20] and the Commission's S&P 400 surrogate group, for two periods, are plotted in Figures 5 and 6. The figures begin at the end of December of 1990 and 1991, respectively. The figures appear to have several relevant messages.

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[19] "Beta" is a measure of how much a stock moves on average when the market as a whole moves. Beta is the risk measure used in the "Capital Asset Pricing Model" ("CAPM"), but it is a more general concept than the CAPM. Here, we use the procedure not as a way of estimating the cost of capital, but rather as a way of predicting movements in the portfolio based on stock market movements. That is, one can accept this particular way of predicting the market-related movement in a particular portfolio without necessarily accepting the CAPM. For more details on beta and the CAPM, see, for example, Richard A. Brealey and Stewart C. Myers, 1991, *Principles of Corporate Finance* (4th edition), New York: McGraw-Hill, Inc., Chapters 7 to 9; and A. Lawrence Kolbe and James A. Read, Jr., with George R. Hall, 1984, *The Cost of Capital*, Cambridge, MA: The MIT Press, Chapter 3. See also The Brattle Group's companion report on rate of return, A.L. Kolbe and L.S. Borucki, "Rate of Return Issues in Cable Television Cost-of-Service Regulation," which is also being filed in response to this NPRM on behalf of Cablevision Industries Corporation, Providence Journal Company, Consolidated Cable Partners, L.P., Crown Media, Inc., MultiVision Cable TV Corporation, and ParCable, Inc.

[20] For simplicity, we use only the return predicted by the value-weighted betas. This does not make a material difference.